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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: AN AIR-BAG

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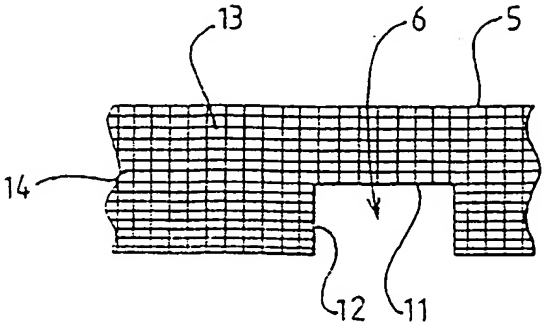

(57) Abstract: An air-bag (1) is disclosed which contains a woven gas supply duct (5). The gas supply duct (5) is configured to be connected to a gas generator and is provided with a plurality of apertures (6) formed therein. The apertures (6) are positioned to direct a flow of gas in the gas supply duct to areas or regions (7, 8, 9) of the air-bag which are to be inflated. The apertures (6) are rectangular apertures, and the edges of the apertures are co-aligned with warp and weft yarns forming the gas supply duct.

"AN AIR-BAG"

THE PRESENT INVENTION relates to an air-bag, and more particularly relates to an air-bag of the type in which an inner gas supply tube is provided within the air-bag, the gas supply tube being adapted to be connected to a gas generator, the gas supply tube having apertures formed in the wall thereof to direct gas into discrete inflatable regions or chambers formed within the air-bag.

It has been proposed to provide an air-bag which has a plurality of inflatable regions or chambers which are to be supplied with gas from a gas generator. On example of such an air-bag is so-called "inflatable curtain" which is adapted to be mounted in the roof of the vehicle above the door openings of the vehicle, and is also adapted, when an accident occurs, to be deployed to lie adjacent the window openings formed in the door, thus forming a protective curtain located between the occupant of the vehicle and the side of the vehicle. Such inflatable curtains provide protection to the occupant of the vehicle in the event of a side impact or roll-over situation.

DE-A-19939618 discloses a safety device of this type in which the inflatable curtain is formed of an inflatable element which is divided into a plurality of regions or chambers which are to be inflated. An internal fabric gas

supply duct is provided. That gas supply duct is provided, along its length, with circular apertures formed in the wall of the duct through which gas can flow from the duct into those regions or chambers of the inflatable element which are to be inflated. It has been found that there is frequently substantial damage to the gas supply duct in the region of the circular apertures, especially damage in the form of fraying of the fabric, when the inflatable element has been inflated. This is undesirable since it can lead to an unpredictable inflation characteristic.

The present invention seeks to provide an improved air-bag.

According to this invention there is provided an air-bag containing a woven gas supply duct, the gas supply duct being adapted to be connected to a gas generator, and having apertures formed therein, the apertures being positioned to direct a flow of gas in the gas supply duct to areas or regions of the air-bag which are to be inflated, wherein the apertures are rectangular apertures, the edges of the apertures being co-aligned with warp and weft yarns forming the gas supply duct.

Preferably the warp and weft yarns are aligned with the axis and extend transverse to the axis of the gas supply duct, the sides of the aperture lying parallel to and transverse to the axis of the duct.

Alternatively the warp and weft yarns extend 45^0 to the axis of the gas supply duct, the sides of the aperture also lying at 45^0 to the axis of the supply duct.

Advantageously the air-bag has a plurality of separate regions which are to be inflated and has, at one edge, fixing means to fix the air-bag to part of the roof of a motor vehicle, the air-bag being in the form of an inflatable curtain.

The invention also relates to a method of making an air-bag as described above, the method comprising the step of forming said apertures using a laser-cutting technique.

In order that the invention may be more readily understood, and so that further feature thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic side view of an air-bag in accordance with the invention,

FIGURE 2 is an enlarged view of part of Figure 1,

FIGURE 3 is an enlarged view of part of Figure 2, and

FIGURE 4 is a view corresponding to Figure 3 illustrating a modified embodiment of the invention.

Referring initially to Figure 1 of the accompanying drawings, an air-bag 1 is illustrated which is intended to form a so-called inflatable curtain. The air-bag 1 has an upper edge 2 provided with a plurality of mounting lugs 3 which are adapted to be connected to a plurality of mounting points provided in the roof-line of the motor vehicle. The mounting points will not be in linear alignment, but will, typically, follow the roof-line of the vehicle and will include mounting points provided on either the "A"-Post or the "C"-Post.

The air-bag is provided with a protruding strap 4 adapted to be connected to a further mounting point.

The air-bag is provided, within its interior, with a gas supply duct 5, adapted to be connected, at one end, to a gas generator. The gas supply duct 5 is provided, at selected points spaced along its length, with gas outlet apertures 6. The gas outlet apertures 6 communicate with a plurality of separate inflatable regions 7, 8, 9 of the air-bag. The inflatable region 9 is provided with seams 10 which across it dividing the region 9 into a plurality of substantially parallel chambers. Air-bags of this general design are well known.

Referring now to Figure 2 of the accompanying drawings, which shows part of the air-bag 1 of Figure 1 to an enlarged scale, it can be seen that the fabric gas supply duct 5 is provided with a plurality of apertures 6 which are not of circular form, but which are of rectangular form. Here it is to be understood that in this Specification the term "rectangle" is intended to mean a four-sided plane rectilinear figure with four right angles, and includes, within the definition, a square.

As can be seen more clearly from Figure 3, the aperture 6 that is formed in the gas duct 5 is so orientated that the sides 11 and 12 of the rectangular aperture 6 are co-aligned with the warp and weft fibres 13, 14 of the gas duct 5. The aperture 6 may be cut using a laser cutting technique. It is believed that a rectangular aperture of this type, having the sides of the aperture in alignment with the warp and weft fibres, will lead to a minimum amount of fraying during deployment of the air-bag. The use of a laser-cutting technique will help to "heat-seal" the fibres.

It is to be appreciated that in Figure 3, the warp and weft fibres of the fabric run in alignment with and transverse to the axis of the gas duct 5. The gas duct 5 may, alternatively, be woven in such a way that the warp and weft fibres extend at 45^0 to the axis of the gas duct, with the gas duct thus effectively being a "braided" tube. In such a situation, an aperture 15 may be provided within the gas duct, as shown in Figure 4, that aperture 15 again being rectangular, and having the sides 16, 17 thereof aligned with the warp and weft fibres 18, 19. The aperture may, therefore, be considered to present a "diamond" shape, but the aperture will still be rectangular.

In the present Specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

CLAIMS:

1. An air-bag containing a woven gas supply duct , the gas supply duct being adapted to be connected to a gas generator, and having apertures formed therein, the apertures being positioned to direct a flow of gas in the gas supply duct to areas or regions of the air-bag 1 which are to be inflated, wherein the apertures are rectangular apertures, the edges of the apertures being co-aligned with warp and weft yarns forming the gas supply duct .

2. An air-bag arrangement according to Claim 1 wherein the warp and weft yarns are aligned with the axis and extend transverse to the axis of the gas supply duct, the sides of the aperture lying parallel to and transverse to the axis of the duct.

3. An arrangement according to Claim 1 wherein the warp and weft yarns extend 45^0 to the axis of the gas supply duct, the sides of the aperture also lying at 45^0 to the axis of the supply duct.

4. An air-bag arrangement according to any one of the preceding Claims wherein the air-bag has a plurality of separate regions which are to be inflated and has, at one edge, fixing means to fix the air-bags to part of the roof of a motor vehicle, the air-bag being in the form of an inflatable curtain.

5. A method of making an air-bag according to any one of the preceding Claims, the method comprising the step of forming said apertures using a laser cutting technique.

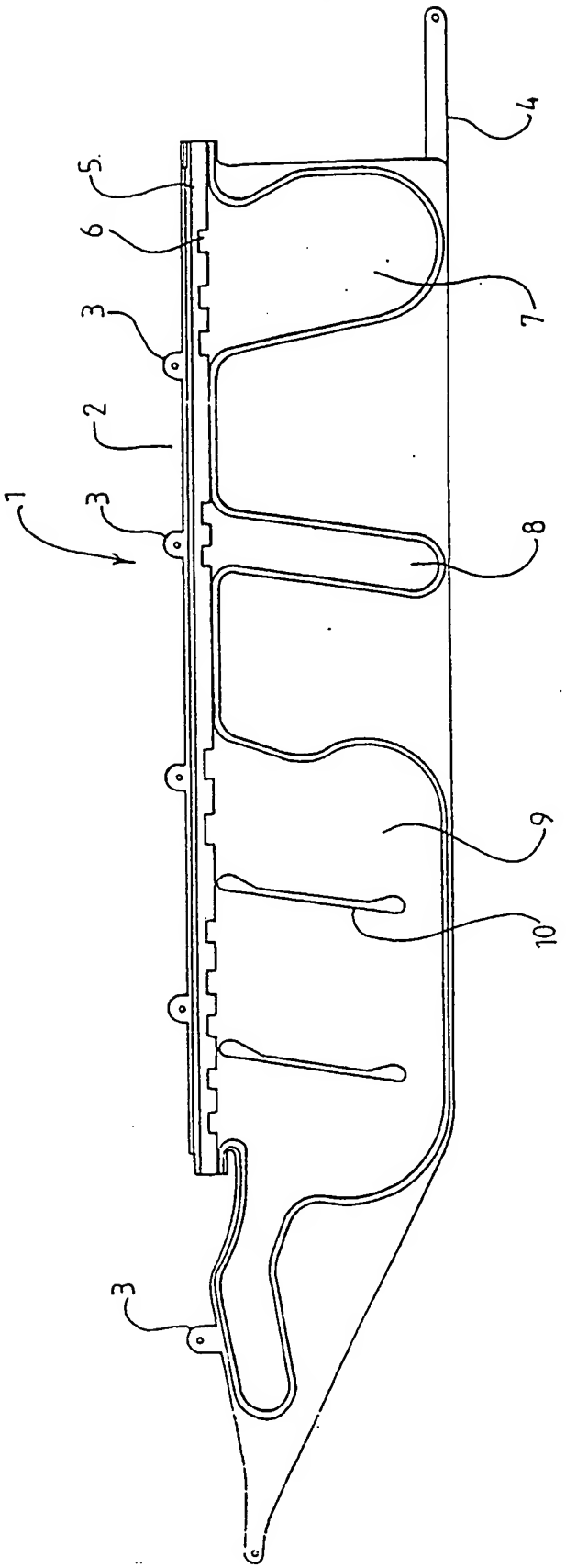

FIG 1

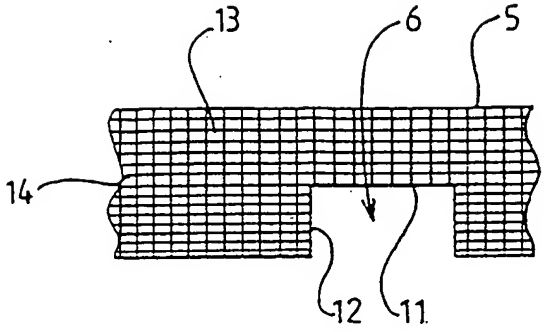

FIG 3

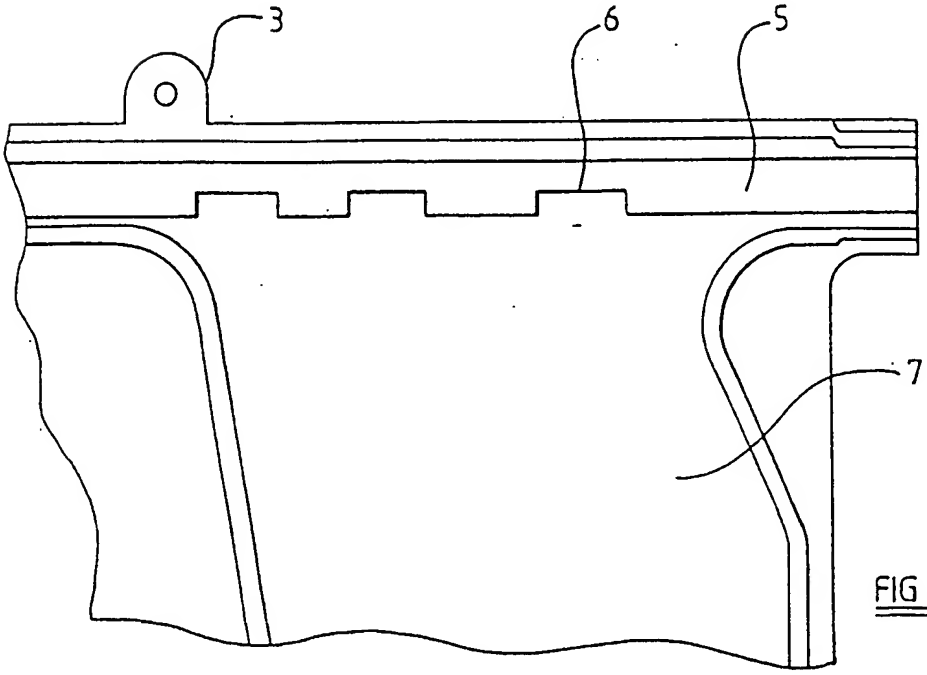

FIG 2

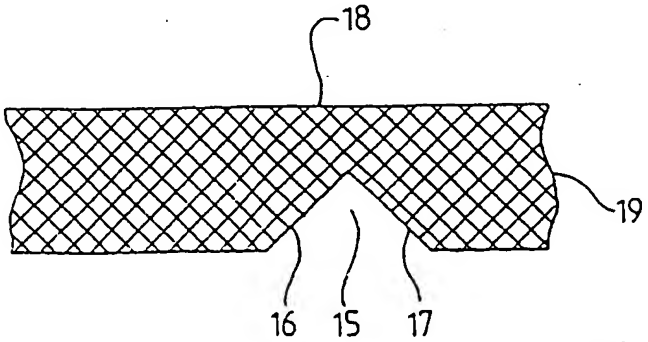

FIG 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 02/02129

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B60R 21/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL,WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 19939618 A1 (TAKATA CORP), 18 May 2000 (18.05.00) --	1
A	US 6073961 A (BAILEY ET AL), 13 June 2000 (13.06.00) --	1
P,A	US 6382662 B1 (IGAWA), 7 May 2002 (07.05.02) --	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 March 2003	11-03-2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Hans Nordström/EK Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

30/12/02

International application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19939618 A1	18/05/00	JP 2000127886 A	09/05/00
		US 6199898 B	13/03/01
		US 2001019201 A	06/09/01
US 6073961 A	13/06/00	BR 9909265 A	05/12/00
		EP 1054790 A	29/11/00
		JP 2002503581 T	05/02/02
		US 6237941 B	29/05/01
		WO 9942333 A	26/08/99
US 6382662 B1	07/05/02	JP 2001080440 A	27/03/01

Application No:	GB 0130225.6	**Examiner:**	Guy Robinson
Claims searched:	1 to 5	**Date of search:**	21 March 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): B7B (BSBCC, BSBCR)

Int Cl (Ed.7): B60R 21/16, 21/20, 21/24

Other: ONLINE: WPI, EPODOC, JAPIO, INTERNET

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 6199898 (TAKATA)	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.